

Attorney Docket No.: MTRL020US0 (SC12589TP)

PATENTS  
Customer No. 37,141

Please amend the claims as follows:

- 1.(Amended) A method for cleaning a semiconductor device, comprising the steps of:  
providing a semiconductor device having organometallic processing residues on a surface thereof; and  
applying removing the residues through the application of a micellar solution to the semiconductor device.
- 2.(Currently Amended) The method of claim 1, wherein the semiconductor device contains at least one opening, and wherein the micellar solution is applied to the opening.
- 3.(Original) The method of claim 2, wherein the opening has processing residues on a surface thereof which were formed during the creation of the opening, and wherein the micellar solution is adapted to remove the processing residues.
- 4.(Original) The method of claim 3, wherein the processing residues include organometallic polymers.
- 5.(Original) The method of claim 1, wherein the semiconductor device has a bulk dielectric constant K which is below 3.0.
- 6.(Currently Amended) The method of claim 1, wherein the micellar solution comprises a hydrocarbon surfactant, and wherein the hydrocarbon surfactant solution is present in the micellar solution at a concentration of less than about 1% by weight.
- 7.(Original) The method of claim 1, wherein the micellar solution comprises a fluorocarbon surfactant.

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8.(Original) The method of claim 1, wherein the micellar solution comprises a surfactant having at least one carboxyl group.

9.(Currently Amended) The method of claim 8, wherein the micellar solution comprises oxalic acid.

10.(Original) The method of claim 1, wherein the micellar solution comprises an aqueous solution of fluorosurfactant and hydrofluoric acid.

11.(Original) The method of claim 1, wherein the micellar solution comprises ethylene glycol monobutyl ether.

12.(Original) The method of claim 1, wherein the micellar solution comprises citric acid.

13.(Original) The method of claim 1, wherein the semiconductor device contains copper conductor levels.

14.(Original) The method of claim 1, wherein the semiconductor device has a surface comprising a material selected from the group consisting of copper and silicon, and wherein the micellar solution is used to clean the surface.

15.(Currently Amended) A method for removing processing residues from a semiconductor substrate, comprising the step of:

providing a semiconductor substrate having a plurality of openings therein, said openings having a ~~processing~~ an organometallic processing residue disposed on a surface thereof; and

applying a micellar solution to the semiconductor substrate, thereby removing at least a portion of the processing residue from the plurality of openings.

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16.(Original) The method of claim 15, wherein the processing residue is formed, at least in part, when the openings are etched.

17.(Original) The method of claim 15, wherein the semiconductor substrate contains copper conductor levels.

18.(Currently Amended) A method for making a semiconductor device, comprising the steps of:

providing a semiconductor substrate;

etching a plurality of openings in the semiconductor substrate such that, upon completion of the etch, at least some of the openings have ~~a processing~~ an organometallic processing residue disposed on a surface thereof, the processing residue having been formed during the etching process; and

removing at least a portion of the processing residue by contacting the processing residue with a micellar solution.

19.(Currently Amended) The method of claim 18, wherein the micellar solution comprises a hydrocarbon surfactant, and wherein the hydrocarbon surfactant ~~solution~~ is present in the micellar solution at a concentration of less than about 1% by weight.

20.(Currently Amended) The method of claim 18 ~~claim 19~~, wherein the micellar solution comprises, by weight, about 0.01% to about 1% hydrocarbon surfactant, about 1% to about 10% citric acid, about 1% to about 10% oxalic acid, and about 1% to about 10% ethylene glycol monobutyl ether (EGMBE).

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21.(Original) The method of claim 18, wherein the semiconductor substrate has a bulk dielectric constant K which is below 3.0.

22.(New) A method for making a semiconductor device, comprising the steps of:

providing a semiconductor substrate;

etching a plurality of openings in the semiconductor substrate such that, upon completion of the etch, at least some of the openings have a processing residue disposed on a surface thereof, the processing residue having been formed during the etching process; and

removing at least a portion of the processing residue by contacting the processing residue with a micellar solution, wherein the micellar solution comprises, by weight, about 0.01% to about 1% hydrocarbon surfactant, about 1% to about 10% citric acid, about 1% to about 10% oxalic acid, and about 1% to about 10% ethylene glycol monobutyl ether (EGMBE).

23.(New) The method of claim 22, wherein the processing residues include organometallic polymers.

24.(New) The method of claim 22, wherein the semiconductor device has a bulk dielectric constant K which is below 3.0.

25.(New) The method of claim 22, wherein the micellar solution further comprises a fluorocarbon surfactant.

26.(New) The method of claim 22, wherein the micellar solution further comprises an aqueous solution of fluorosurfactant and hydrofluoric acid.

27.(New) The method of claim 22, wherein the semiconductor device contains copper conductor levels.

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28.(New) The method of claim 22, wherein the semiconductor device has a surface comprising copper, and wherein the micellar solution is used to clean the surface.

29.(New) The method of claim 1, wherein said solution is devoid of hydroxylamine solvents.